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The probability of return to the initial position for a particle diffusing in porous media

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Abstract

A recent approximate calculation (by Mitra and coworkers) of the probability density of return to the initial position by time t for a particle diffusing in a porous medium is shown to be incorrect and to yield systematic errors whose magnitudes depend on the nature of the sample and on t. Another approach to approximate calculation of this characteristic is proposed, and the resultant errors are estimated. The value that is proposed for calculation is the probability of the return of the diffusing particle to the plane that is perpendicular to the pulse gradient of the magnetic field and passes through the point of the initial particle position. These characteristics are compared by the example of self-diffusion of a liquid in sandstones.